

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1-4. (Canceled)

5. (Withdrawn) A filter assembly for capturing debris within a blood vessel, comprising:

- an elongate shaft having a proximal end and a distal end;
- a filter disposed proximate the distal end of the elongate shaft; and
- a means for reducing the volume of the captured debris.

6. (Withdrawn) The filter assembly of claim 5, wherein the means for reducing the volume of the captured debris comprises a lumen defined by the elongate shaft; and

a fluid source fluidly communicating with the lumen for delivering a pharmaceutical agent to a location proximate the filter.

7. (Withdrawn) The filter assembly of claim 5, wherein the elongate shaft comprises an electrically conductive core and an electrically insulating layer overlaying the electrically conductive core; and

the means for reducing the volume of the captured debris comprises a radio frequency energy source electrically coupled to the electrically conductive core of the elongate shaft and at least one aperture extending through the electrically insulating layer of the elongate shaft.

8. (Withdrawn) The filter assembly of claim 5, wherein the filter has a first portion having a first included angle and a second portion having a second included angle;

the first included angle being greater than the second included angle; and
the second portion of the filter being configured such that fine debris will be extruded through the second portion of the filter when the filter is collapsed.

9. (Withdrawn) A filter assembly for capturing debris within a blood vessel, comprising:

an elongate shaft having a proximal end and a distal end;
a filter disposed proximate the distal end of the elongate shaft; and
a lumen defined by the elongate shaft for delivering a pharmaceutical agent to an area proximate the filter.

10. (Withdrawn) The filter assembly of claim 9, further including at least one aperture defined by a wall of the elongate shaft and fluidly communicating with the lumen.

11. (Withdrawn) The filter assembly of claim 9, further including a fluid source coupled to the proximal end of the elongate shaft and fluidly communicating with the lumen.

12. (Withdrawn) The filter assembly of claim 9, wherein the filter includes an expandable frame.

13. (Withdrawn) The filter assembly of claim 9, wherein the filter includes a filter membrane.

14. (Withdrawn) The filter assembly of claim 9, wherein the frame comprises a shape memory material.

15. (Withdrawn) The filter assembly of claim 9, wherein the shape memory material comprises a shape memory alloy.

16. (Withdrawn) The filter assembly of claim 9, wherein the shape memory alloy comprises nitinol.

17. (Withdrawn) The filter assembly of claim 9, wherein the filter membrane portion of the filter tapers distally.

18. (Withdrawn) The filter assembly of claim 9, wherein the membrane includes polyurethane.

19. (Withdrawn) The filter assembly of claim 9, wherein the membrane defines a plurality of apertures.

20. (Withdrawn) A filter assembly for capturing debris within a blood vessel, comprising:

an elongate shaft having a proximal end and a distal end;

a filter disposed proximate the distal end of the elongate shaft;

the elongate shaft comprising an electrically conductive core and an electrically insulating layer overlaying the electrically conductive core; and

at least one aperture extending through the electrically insulating layer of the elongate shaft.

21. (Withdrawn) The filter assembly of claim 20, wherein the at least one aperture is disposed proximate the filter.

22. (Withdrawn) The filter assembly of claim 20, further including a lead wire electrically coupled to the elongate shaft.

23. (Withdrawn) The filter assembly of claim 20, further including a radio frequency energy source electrically coupled to the conductive core of the elongate shaft.

24. (Withdrawn) The filter assembly of claim 20, wherein the filter includes an expandable frame.

25. (Withdrawn) The filter assembly of claim 20, wherein the filter includes a filter membrane.

26. (Withdrawn) The filter assembly of claim 20, wherein the frame comprises a shape memory material.

27. (Withdrawn) The filter assembly of claim 20, wherein the shape memory material comprises a shape memory alloy.

28. (Withdrawn) The filter assembly of claim 20, wherein the shape memory alloy comprises nitinol.

29. (Withdrawn) The filter assembly of claim 20, wherein the filter membrane portion of the filter tapers distally.

30. (Withdrawn) The filter assembly of claim 20, wherein the membrane includes polyurethane.

31. (Withdrawn) The filter assembly of claim 20, wherein the membrane defines a plurality of apertures.

32-51. (Canceled)

52. (Previously Presented) A filter assembly for capturing debris within a blood vessel, comprising:
an elongate shaft having a proximal end and a distal end;

a filter disposed proximate the distal end of the elongate shaft, the filter including a filtering region and an attachment region, the filter having an expanded and a contracted shape;

in the expanded shape, the filtering region including a major opening defined adjacent the filtering region proximal end and only a single layer of filter membrane defining a filter basket and extending between the major opening and the distal end of the filtering region, the filter membrane having a plurality of apertures defined therein that are configured to allow the passage of blood through the filtering region;

the filter membrane further comprising a first generally linearly tapered portion and a second generally linearly tapered portion, the first tapered portion defining a first included angle, and the second tapered portion extending proximally from a proximal portion of the first tapered portion, the second tapered portion defining a second included angle greater than the first included angle; and

wherein the first tapered portion extends at the first included angle for a substantial length of the first tapered portion and the second tapered portion extends at the second included angle for a substantial length of the second tapered portion;

wherein the filter assembly further comprises an expandable frame disposed within and supporting the first tapered portion and the second tapered portion.

53. (Canceled)

54. (Previously Presented) The filter assembly of claim 52, wherein the first tapered portion has a conical shape.

55. (Previously Presented) The filter assembly of claim 52, wherein the second tapered portion has a frustoconical shape.

56. (Previously Presented) The filter assembly of claim 52, wherein the filter membrane includes polyurethane.

57. (Canceled)

58. (Previously Presented) The filter assembly of claim 52, wherein the expandable frame comprises a shape memory material.

59. (Previously Presented) The filter assembly of claim 58, wherein the shape memory material comprises a shape memory alloy.

60. (Previously Presented) The filter assembly of claim 59, wherein the shape memory alloy comprises Nitinol.

61. (Previously Presented) The assembly of claim 52, wherein the expandable frame includes a plurality of filter struts each having a proximal end and a distal end.

62. (Previously Presented) The assembly of claim 61, wherein said plurality of filter struts are adapted to bias the filter in an expanded position.

63. (Previously Presented) The assembly of claim 61, wherein the proximal end of each filter strut is connected to a filter mouth frame.

64. (Previously Presented) The assembly of claim 52, further including a retrieval sheath for retrieving the filter.

65. (Previously Presented) The filter assembly of claim 64, wherein the first tapered portion has a base diameter, the base diameter being smaller than an inner diameter of the retrieval sheath.

66. (Previously Presented) The assembly of claim 64, wherein the first tapered portion has a base diameter, the base diameter being similar to an inner diameter of the retrieval sheath.

67. (Previously Presented) The filter assembly of claim 64, wherein second tapered portion has a first diameter at the base diameter and a second diameter greater than the first diameter, and wherein the first diameter is similar to the inner diameter of the retrieval sheath when the filter assumes an expanded shape.

68. (Previously Presented) The filter assembly of claim 64, wherein the first tapered portion has a base diameter, the filter assembly further including a limiter that limits the base diameter of the first tapered portion to a diameter that is substantially similar to an inner diameter of the retrieval sheath.

69. (Previously Presented) The filter assembly of claim 68, wherein the limiter comprises a wire loop.

70. (Previously Presented) The filter assembly of claim 52, wherein the attachment region extends proximally from the filtering region, attaching a proximal end of the filtering region to the elongate shaft.

71. (Previously Presented) The filter assembly of claim 52, wherein the attachment region comprises struts that extend from the major opening in a generally proximal direction to attach to the elongate member.

72. (Previously Presented) A filter assembly for capturing debris within a blood vessel, comprising:

an elongate shaft having a proximal end and a distal end;

a filter disposed proximate the distal end of the elongate shaft, the filter having an expanded and a contracted shape, the filter including a filtering region and an attachment region, the filtering region defining a major opening adjacent a proximal end of the filtering region;

the attachment region comprising at least one strut extending proximally from adjacent the major opening to the elongate shaft;

in the expanded shape, the filtering region including only a single layer of filter membrane defining a filter basket and extending between the major opening and the distal end of the filtering region, the filter membrane having a plurality of apertures defined therein that are configured to allow the passage of blood through the filtering region;

the filtering region further comprising a first generally linearly tapered portion and a second generally linearly tapered portion, the first tapered portion defining a first included angle and the second tapered portion defining a second included angle which is different than the first included angle; and

wherein the first tapered portion extends at the first included angle for a substantial length of the first tapered portion and the second tapered portion extends at the second included angle for a substantial length of the second tapered portion;

wherein the filter assembly further comprises an expandable frame disposed within and supporting the first tapered portion and the second tapered portion.

73. (Canceled)

74. (Previously Presented) The filter assembly of claim 72, wherein the first tapered portion has a conical shape.

75. (Previously Presented) The filter assembly of claim 72, wherein the second tapered portion has a frustoconical shape.

76. (Previously Presented) The filter assembly of claim 72, wherein the filter membrane includes polyurethane.

77. (Canceled)

78. (Previously Presented) The filter assembly of claim 72, wherein the expandable frame comprises a shape memory material.

79. (Previously Presented) The filter assembly of claim 78, wherein the shape memory material comprises a shape memory alloy.

80. (Previously Presented) The filter assembly of claim 79, wherein the shape memory alloy comprises Nitinol.

81. (Previously Presented) The assembly of claim 72, wherein the expandable frame includes a plurality of filter struts each having a proximal end and a distal end.

82. (Previously Presented) The assembly of claim 81, wherein said plurality of filter struts are adapted to bias the filter in an expanded position.

83. (Previously Presented) The assembly of claim 81, wherein the proximal end of each filter strut is connected to a filter mouth frame.

84. (Previously Presented) The assembly of claim 72, further including a retrieval sheath for retrieving the filter.

85. (Previously Presented) The filter assembly of claim 84, wherein the first tapered portion has a base diameter, the base diameter being smaller than an inner diameter of the retrieval sheath.

86. (Previously Presented) The assembly of claim 84, wherein the first tapered portion has a base diameter, the base diameter being similar to an inner diameter of the retrieval sheath.

87. (Previously Presented) The filter assembly of claim 84, wherein second tapered portion has a first diameter at the base diameter and a second diameter greater than the first diameter, and wherein the first diameter is similar to the inner diameter of the retrieval sheath when the filter assumes an expanded shape.

88. (Previously Presented) The filter assembly of claim 84, wherein the first tapered portion has a base diameter, the filter assembly further including a limiter that limits the base diameter of the first tapered portion to a diameter that is substantially similar to an inner diameter of the retrieval sheath.

89. (Previously Presented) The filter assembly of claim 88, wherein the limiter comprises a wire loop.

90. (Previously Presented) The filter assembly of claim 72, wherein the second tapered portion extends proximally from a proximal portion of the first tapered portion.

91. (Previously Presented) The filter assembly of claim 72, wherein the single layer of filter membrane includes the first and second tapered portions.

92. (Previously Presented) The filter assembly of claim 72, wherein the second included angle is larger than the first included angle.

93. (Previously Presented) The filter assembly of claim 72, wherein the attachment region includes four struts.

94. (Previously Presented) The filter assembly of claim 52, wherein the only single layer of filter membrane does not fold back on itself when the filter is in the expanded shape.

95. (Previously Presented) The filter assembly of claim 72, wherein the only single layer of filter membrane does not fold back on itself when the filter is in the expanded shape.